



# Analog Leaders on the Digital Battlefield

by Lieutenant Colonel John R. Drebus

## Digital vs. Analog

The application of digital technology to the battlefield is promising a revolution in land warfare. In a broad sense, the term “digital” is used to describe the electronic sensors, computers, software, databases, and communications that provide a command and control advantage. A more precise definition of digital, however, is in the characterization of the signal or data representation that these devices use.

An analog system or device operates by using directly measurable quantities such as voltages, rotations, or positions. The result is a continuous and varying signal. Digital devices, on the other hand, represent a signal or waveform as a series of discrete numbers — hence the term digital. While this digital model may only approximate the original input at a point in time, digital information has the advantage of being more accurately transmitted, stored, and reproduced. A phonograph record is analog, a compact disk is digital. The optical range finder used on the older tanks was analog, the laser rangefinder is digital. For the sake of simplicity, this article refers to any control system or measuring tool that does not use discrete numbers as analog, those that do as digital.

Unlike much of the electronic equipment they use, soldiers are analog creatures. Like all humans, they have essentially

two biological methods of control: the nervous system and the endocrine system. The nervous system, the more highly developed and precise, is centered in the brain and accounts for motor control, sensory input, and reason. Although the nervous system is often compared to a digital computer, it is an analog system that transmits minute electrical impulses along the neurons and uses chemicals to cross the synapse between nerve endings. Each brain is unique and exhibits varying results of performance.

The other human control method, the endocrine system, consists of a cruder involuntary form of signaling, using glands to flood the bloodstream with chemicals called hormones. An example is the adrenal glands that secrete epinephrine (adrenaline) when a person experiences anger or fear. This hormone causes a quickening pulse, faster breathing, and increased metabolism, all which are useful responses in fight-or-flight situations. Both of these control methods create useful reactions, but their accuracy and repeatability are neither as precise nor as reliable as those of a digital system.

Considering these limitations, how can a leader use digital technology to perform his job while taking advantage of his own analog characteristics to lead analog soldiers? This article will briefly examine the role of digital and analog systems and their impact on four aspects

of military leadership — training, combat skills, decisiveness, and courage.

## Training

Unlike computers and the simulators used to train them, simply inserting a disk of digital instructions cannot quickly program soldiers. The soldier learns via his analog senses — primarily sight, hearing, and touch. Each soldier also has a different mental capacity for understanding and retention. Some will quickly assimilate new skills while others will require more practice.

Digital battlefield simulators have drastically altered military training and can tailor the situation to the individual soldier's training needs. Computers and sensors are now used to imitate almost any combat scenario imaginable. Soldiers are repeatedly subjected to intense simulated combat, improving their skills with each segment of the training exercise. This is accomplished without large training areas, expending critical resources such as fuel and ammunition, or exposing soldiers to the safety risks inherent with using heavy equipment under adverse conditions.

Unfortunately, the conditions under which this training is applied are often sterile in terms of the physical environment that will actually be encountered in the field. The digital simulations should be supplemented with training situations *out-*

*side of the classroom* while stressing the analog senses of the soldier through physical exertion, lack of sleep, and exposure to weather. Ideally, simulation systems are integrated with actual weapons sights and combat vehicle data displays to offer the flexibility of digital simulation within a more realistic physical environment. Making decisions in a cramped, noisy armored vehicle with cold rain trickling down your neck is much different than the same exercise sitting in a comfortable chair, in an air-conditioned classroom, with plumbing and a cafeteria available down the hall.

The fact that machines perform repetitive tasks better than humans is widely recognized. Machines, such as automatic loaders and optical/electronic devices, that perform target acquisition and aiming are replacing many mundane tasks. Some prognosticators have even predicted the demise of humans on the battlefield, replaced by robot counterparts programmed for every known eventuality. The problem is that machines will cope only with *known* or *anticipated* circumstances. Programmed machines do not respond well to surprises, and history demonstrates that the battlefield is filled with surprises.

Fortunately, humans have cognitive skills that computers still do not possess, despite advances in such fields as artificial intelligence, genetic programming, and neural networks. These unique capabilities include creativity, inventiveness, and the ability to adapt to changing and unexpected situations. Every soldier has a favorite story or two about an ingenious field expedient that was devised when the engineered equipment failed or the school solution did not work. In combat, necessity truly is the mother of invention, particularly on those battlefields where a new or superior weapon is first introduced with lethal surprise. At those times, there is no luxury of waiting for research and development to respond with a solution. Soldiers must find solutions using innovative tactics and the tools at hand. Some of the most interesting and useful training documents are those illustrating lessons learned and ingenious field expedients.

Training should therefore include a strong emphasis on encouraging the unique creative analog capabilities of the soldier. Since war will always contain surprise and uncertainty, surprise and uncertainty should be a staple of training exercises. How do you effectively employ your weapons in a night attack when half of them have suddenly lost their night vision capability? How do you react in train-

ing when a key system is “unplugged” by the instructor? What tactics do you use when the enemy suddenly behaves irrationally or does not follow expected doctrinal behavior? The rewards in training should not necessarily go to those who best conform, but rather to those who display innovation and initiative in meeting unexpected challenges.

### Combat Skills

Modern technology is truly amazing. The warrior pushes the button of a laser range finder and obtains an instantaneous precise digital readout of range to target — the technical variable that most frequently causes aiming error and prevents accurate fire. A button is pushed on a global positioning satellite (GPS) receiver and it provides another digital readout of exact coordinates — the key parameter in land navigation. Other buttons are used for sending digital spot reports of combat action, and digital screens display digital positions of friendly and enemy forces. Truly amazing and incredibly useful — when it all works.

While the military force that can master and use advanced technology has a tremendous advantage over its enemy, the more advanced the technology becomes, the greater the loss in capability when it fails. Unfortunately, all technology can fail, even if only temporarily. Indeed, the enemy will go to great lengths

to cause it to fail. If a soldier knows how to use only modern digital tools, he becomes vulnerable if those tools malfunction.

If GPS satellites are destroyed, will the leader become hopelessly lost? Or will he pick up an inexpensive magnetic compass and a paper map (both analog devices) to find his way? When the battery on the laser range finder unexpectedly expires, will the leader use that compass, map, and field glasses with reticle (another simple analog device) and adjust artillery fire? When the computer on his combat vehicle fails, will the leader become helpless and ineffective or will he reach into his pocket and use a small notebook of reporting templates to inform his superiors (verbally or by messenger) of the battle's progress?

The history of warfare has always been part of the intellectual nourishment of successful military leaders. In the future, however, the most successful leaders will be military technology history students. They will retain the analog skills and tools as backups in the event that enemy action or the interruption of repair and supply deprives them of their primary electronic digital tools. If the digital weapons malfunction, it may become necessary to fix more primitive, but reliable, analog “bayonets” and continue the fight.



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## Decisiveness

The greatest promise of the digital battlefield is that it will finally clear away the fog of war. Modern sensor technology, combined with digital communications and computer data processing, will provide leaders at all levels with an accurate assessment of enemy positions and movements while also pinpointing friendly forces in the confusion of combat. The force that possesses this capability will make faster and better decisions than their opponents and thus will maintain the initiative. Again, this is a tremendous tool — when it works and if it is used properly.

Unfortunately, massive amounts of digital transmissions could replace the fog of war with a swamp of data. As bandwidth and transmission speeds increase, the temptation is to use the entire capacity. However, just because data are available does not mean that they are useful. Senior leaders (staff and line) may be tempted to deviate from their primary tasks, such as establishing the operations plan, providing logistics and fire support, and directing the overall battle, and instead become involved in micromanaging subordinate units. A division commander and his staff should not usurp the initiative of the platoon leader in the detailed placement of his forces simply because they can observe his symbols on a computer screen. The symbols

are merely digital representations of reality. The platoon leader's analog senses more directly perceive that reality.

Two other cautions about digital data must be made. The first is quantity. Technology now allows massive amounts of data to be quickly assimilated into databases. A leader should not have his focus and concentration distracted with information that is untimely or irrelevant to his situation. The second caution is quality. The enemy will most likely be using his most current technology to create digital deception. It is a fallacy to assume that anything displayed on a computer screen is somehow more accurate than what is viewed on a piece of paper or heard as spoken words. Until raw data are analyzed and converted into information and intelligence, they are more of a detractor than a contributor to the leader's decision process.

Instead of speeding up decisions, the convenient and steady flow of digital information could potentially have the opposite effect. If each transmission brings with it a more complete and accurate picture of a developing situation, the temptation may be to delay a decision until an even better appraisal of the battlefield has been obtained. A commander could experience "data paralysis," afraid to make a decision and take action, fearing that the next transmission will provide information that makes his prior

decision appear unwise or hasty. Or, if the digital network has temporarily failed, a leader may have become so dependent on the steady flow of information that he will delay until the digital capability has been restored, lest he make what is later perceived to be a wrong decision.

Perhaps the best advice to combat leaders regarding decisiveness, even on the digital battlefield, is that of General George S. Patton Jr., who stated in his memoirs, "Don't delay: the best is the enemy of the good. By this I mean that a good plan violently executed now is better than a perfect plan next week."<sup>1</sup> While the leader on the digital battlefield should make effective use of technological tools, he should not abandon his analog characteristics: instinct, intuition, experience, and audacity. These have won many battles in the past and will continue to do so in the future.

## Courage

There are circumstances in which no amount of accurate digital information is going to impact the analog functions of the soldier. A paratrooper standing in the open door of a screaming aircraft may have digital sensors that tell him precise airspeed, wind direction, altitude, and speed of descent. Still, his analog nervous and endocrine systems will be working overtime as he fights to control his composure and leap from the door. Fear, fatigue, stress, cold, thirst, and hunger — these are the unwelcome companions of the soldier. A major challenge of any leader is assisting his troops to conquer these enemies so that the mission is accomplished.

Leaders, by definition, lead by example from the front rather than push from a command and control center in the rear. Effective leadership still demands personal contact. In his classic book, *Men Against Fire*, S.L.A. Marshall wrote, "On the field of fire it is the touch of human nature which gives men courage...it is the loss of this touch which freezes men and impairs all action."<sup>2</sup> Only by looking into his soldiers' eyes and hearing with his own ears the tenor of their voices, can a leader assess the analog signals that reveal to him the physical condition and morale of his troops. To the extent that digital technology provides a commander with portable data communications and increased mobility, these tools will allow personal reconnaissance and face-to-face contact with his soldiers while still maintaining contact with his staff. However, if the technology chains

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the leader to a fixed terminal, it weakens his ability to lead and provides an unhealthy excuse to avoid his physical presence at the critical point of the battle.

Technology is morally neutral. Advances in command and control digital electronics and software do not absolve the battlefield leader from the toughest decisions — when to kill and whom to kill. Trends in warfare are moving toward an increase in stability operations and combat in urban areas where it is difficult to discern friend from foe, civilian from combatant. The capability of defining human targets and initiating lethal action are currently beyond technology and remains the responsibility of the combat leader. Civilian casualties caused by unattended and abandoned minefields are examples of weapons left to determine their own targets. The

toughest decisions must still be made by the leader's analog mind. Perhaps it should always be so.

### The Future

Weapons are becoming increasingly lethal while the technologies used to control these weapons are becoming more accurate through the application of digital technology. However, soldiers who operate the digital controls still possess the strengths and weaknesses of the analog human being. Our combat leaders must learn to employ digital technology and reap its advantages while still retaining the analog tools that provide reliable backup and the analog skills that are ultimately the only means of successful leadership of human soldiers.



### Notes

<sup>1</sup>George S. Patton Jr., *War As I Knew It*, Houghton Mifflin, Boston, 1947, p. 354.

<sup>2</sup>S.L.A. Marshall, *Men Against Fire*, Peter Smith, Gloucester, Massachusetts, 1978, p. 41.

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